

E 1.

$H := \text{Homer comes}$ $m := \text{Maggie comes}$

$M := \text{Marge comes}$ $B := \text{Bart comes}$

$L := \text{Lisa comes}$

a) $H \rightarrow M$

b) $m \vee L$

c) $(M \vee B) \wedge \neg(M \wedge B)$

d) $(B \wedge L) \vee (\neg B \wedge \neg L)$

e) $m \rightarrow (L \wedge H)$

① m by cases (b)

$L \wedge H$ (e)

M (a)

$\neg B$ (c)

B (d)

We have B contradicting $\neg B$. So $\neg m$

② L by cases (b)

B (d)

$\neg M$ (c)

$\neg H$ (a)

$\neg m$ ①

So, only Bart and Lisa come

E 2.

Firstly we notice that library can't contain more than 2 books under provided conditions.

Let n be the number of books in library

Suppose $n > 2$.

Then the minimal number of all words in the books is $\sum_{k=0}^{\infty} k$ because every two books can't contain the same amount of words.

But since $n > 2$ we have $\sum_{k=0}^{\infty} k > n$

It contradicts with the fact that number of books is less than number of all words in the books.

So, we have $n \leq 2$

Let w - number of all words in the books

Suppose $n = 0$

Then $w = n = 0$. Contradiction.

Library is not empty.

Suppose $n = 1$

The book should be empty to satisfy $b < w$

Suppose $n = 2$

In this case one book is empty and another should contain only one word to satisfy $b < w$

In both valid cases we have one empty book